PB-245 375

STAFFING AND BUDGETARY GUIDELINES FOR STATE WATER POLLUTION CONTROL AGENCIES. A SURVEY REPORT

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Public Administration Service

Prepared for:

Public Health Service

October 1964

DISTRIBUTED BY:

NTIS

National Technical Information Service
U. S. DEPARTMENT OF COMMERCE

BIBLIOGRAPHIC DATA SHEET	1. Report No.	2.	3. Recipient's Accession No. PB 245 375
4. Title and Subtitle Staffing and budgetary guidelines for state water pollution control agencies			5. Report Date October 1964
			6.
7. Author(s) Herman Jacobs, Richard Pavia, E T Powell			8. Performing Organization Rept. No.
9. Performing Organization Name and Address Public Administration Service 1313 East Sixtieth St. Chicago, Ill.			10. Project/Task/Work Unit No.
			11. Contract/~~Grant No.~~ PH-86-64-140
12. Sponsoring Organization Name and Address Dept of Health, Education and Welfare Public Health Service Washington, D.C. 20201			13. Type of Report & Period Covered
			14.

15. Supplementary Notes

16. Abstracts

The study focuses upon personnel & financial requirements and the problem of water pollution control, concentrating on the State level.

17. Key Words and Document Analysis. 17a. Descriptors

* Water pollution
* Abatement
* Financing
* Personnel

17b. Identifiers/Open-Ended Terms

17c. COSATI Field/Group

PRICES SUBJECT TO CHANGE

18. Availability Statement	19. Security Class (This Report) UNCLASSIFIED	21. No. of Pages 35
	20. Security Class (This Page UNCLASSIFIED	22. Price 3.75

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22. **NTIS Price.** Leave blank.

282027

PB 245 375

STAFFING AND BUDGETARY GUIDELINES FOR STATE WATER POLLUTION CONTROL AGENCIES

A Survey Report

1964

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Public Administration Service

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October 26, 1964

Dr. Gordon E. McCallum, Chief
Division of Water Supply and Pollution Control
Bureau of State Services--Environmental Health
Public Health Service
Department of Health, Education, and Welfare
Washington, D. C. 20201

Dear Dr. McCallum:

We are pleased to present herewith our report, Staffing and Budgetary Guidelines for State Water Pollution Control Agencies, prepared in pursuance of Contract No. PH 86-64-140, dated June 24, 1964.

The controlling contract required that the study examine and report on (a) the minimum total and per capita expenditure required to maintain an effective state program, (b) personnel needs in terms of broad disciplines and in relation to major functions, and (c) minimum surveillance requirements in relation to stream control and facility operation. It further specified that findings should be related to six population groupings of the States (under 500,000; 500,000 to 1 million; one to three million; three to five million; five to ten million; and ten to fifteen million).

Accordingly, the study has focused upon personnel and financial requirements, and the body of the report is principally concerned with presenting findings in relation to them. Because personnel and financial resources, though vital elements, are not the sole determinants of program success, the report briefly sketches principal features of the problem of water pollution control and identifies some of the other factors which may influence the effectiveness of state water pollution control programs.

The study has extended to an examination of materials on state programs and administration in the files of the Public Health Service and elsewhere, visits to water pollution control agencies of 13 states representing the population groupings (Vermont; Montana and South Dakota; Kansas, Oregon, and West Virginia; Indiana, Kentucky, and North Carolina; Florida and Michigan; and Pennsylvania and Texas), and discussions with regional personnel of the Public Health Service. The Association of State and Interstate Water Pollution Control Administrators designated a special committee for the undertaking, and this committee offered counsel in planning the study and reviewed findings in preliminary form. The project was carried out and the report prepared by Thomas R. Jacobi and Richard A. Pavia, with assistance from E. F. Ricketts, all of the staff of Public Administration Service.

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We wish to express our appreciation for cooperation and assistance in the study to the Project Officer, Mr. T. J. Powers, and other members of your staff in Washington and at regional locations, to the many state water pollution control administrators with whom we have consulted, and to the special committee of the Association. The findings and recommendations are, of course, those of Public Administration Service as an independent organization and solely its responsibility.

Sincerely yours,

A. B. Pope

Executive Director

General Aspects of Water Pollution Control

The problem of water pollution in this country can be simply stated. As population increases and industry expands, the supply of fresh water remains the same; we have now reached the point where demand is beginning to overtake supply. This same supply, which appeared inexhaustible at the turn of the century, is being reduced by pollution at a time when ever-increasing calls are being made upon it, with the result that shortages seem imminent.

In spite of the increased attention to pollution control in recent years and the large sums invested by government and industry, the situation continues to deteriorate. Although new sewage and waste treatment plants are being built at an unprecedented rate, they are not keeping pace with the growth of population and industry, and many older plants are working under continuous overload. The present approach, in short, is inadequate, either because the money and effort going into pollution control are insufficient or because they are not applied to best advantage.

The administration of water pollution control is complicated by the number of governmental levels and other interests involved. Ultimate authority rests principally with the state governments which have jurisdiction over waters within the state boundaries and can, in most cases, set their own standards and enforce action by local governments to meet them. The actual financing and building of treatment plants, however, and their day-to-day operation, are functions of local government. The federal government is involved in the problem through a number of its agencies, plays a leading role in technical research, and is increasingly concerned with enforcement.

Industry is responsible for a great deal of existing pollution, is a correspondingly large user of clean water, and is economically concerned with control operations. An equally keen interest in pollution control from a different point of view is held by fish and wild life conservationists, recreation interests, and owners of littoral property. Other functions to be considered in dealing with this problem include irrigation, navigation, and hydroelectric power.

The existing operation in water pollution control is an uneasy compromise between these and other interests and influences. As in most compromises, there are areas of doubtful efficiency in which improvement can be accomplished.

State Administration

There is a wide variety of legislative and administrative approaches to water pollution control among state governments. In most states, more than one agency of the state government is involved, and the total may be as high as six. This division of control is not necessarily inefficient, but it does suggest an administration that has developed piecemeal rather than one designed to fit the problem.

In almost all of the states, one of the agencies concerned is the public health department. This reflects the historical development of pollution control, with emphasis on hygiene and sanitation. In about half of the states, the public health department is responsible for administering federal grants under P. L. 660, and may accordingly be considered the dominant pollution control agency. In the remaining states, P. L. 660 grants are administered by a specially constituted pollution control or conservation agency. The emergence of such latter bodies as the leading state influence in water pollution control may indicate increasing realization that a traditional approach is no longer adequate to a problem which has rapidly growing economic, social, and political aspects. Public health must always be a dominant consideration in pollution control, but it is no longer the only one. Water is not only a domestic necessity, but also an industrial and agricultural asset, a major recreational medium, a source of power, and a means of transport.

When a state budget is drawn up, water pollution control has to compete for a share of the available funds with other desirable objects of expenditure, particularly where it is a subsidiary activity of an agency such as the public health department. This may help to account for the shortage of funds and staff complained of by most state pollution control administrators. The most serious impact of this shortage is the necessary concentration of available resources to meet urgent current needs, at the expense of comprehensive measures and long-range planning.

In view of the growing pressure that will be exerted on state pollution control agencies as the problem becomes more urgent and federal concern over it more insistent, there is need for a strong, efficient agency in every state, with adequate resources in finance, personnel, and technical equipment. Present

indications are that in some states these standards may be approached, while in others there are deficiencies in organization and resources.

An encouraging feature of state administration is the existence of interstate compacts and commissions in several areas. These vary in their influence and effectiveness from advisory committees meeting periodically to highly effective agencies such as those concerned with the Ohio and Delaware river basins. The interstate agency is a promising approach to the problem of planning across jurisdictional boundaries.

State-Local Relations

The disposal of sewage is essentially a local function, and the role of the state agency is one of regulation, supervision, and assistance. It must be accepted that many local jurisdictions, faced with competing demands for limited resources, wish only to be left alone to continue their existing arrangements for sewage disposal.

The practical difficulties of dealing effectively with pollution from sewage are accentuated by the fragmentation of control. While sewage disposal is essentially a local activity, it does not demand the duplication of facilities within a limited area that now exists. The result of this fragmentation, as far as the state pollution control agency is concerned, is that resources must be spread over an unnecessarily large number of sewage authorities and districts, some of them too small for reasonable efficiency. Resources in personnel, advice, training, finance, inspection, and enforcement are dissipated when they could usefully be concentrated on a smaller number of districts to much greater effect.

State-Federal Relations

Reference has already been made to the change of emphasis in water pollution control from the sanitary to sanitation plus conservation. Further evidence of this tendency is the increasing concern of the federal government with pollution control, marked by the passing of P. L. 660 and P. L. 87-88. The impact of federal interest is governed by a number of factors. The problem is a national one of increasing urgency, and the national government cannot ignore it; on the other hand, jurisdiction over local authorities and industry within a state is largely an

internal affair of the state. An additional complication is that a number of federal agencies are independently concerned with the problem to a greater or lesser extent.

Industry

Water is an essential raw material in most industries, and with the growth and proliferation of industry generally, industrial demand for water is increasing even more rapidly than domestic demand. Most water used by industry is returned to the source stream polluted in some way and to some degree, and the pollution may not be susceptible to the normal processes of biological regeneration. In considering the control of industrial pollution, it is necessary to keep in mind two basic facts. First, for any industry, pollution control is a largely unproductive expenditure, except for minor items of by-product recovery. Second, an industry may well be the main source of employment and prosperity in a locality. It has been suggested that too enthusiastic an implementation of pollution control measures by a state agency may evoke threats from industry of moving to a more amenable locality, and may affect adversely the influx of new industry into the area.

Other Interests

Two distinct contributions to pollution are made by agriculture. In the dry western areas of the nation demands for irrigation account for a major proportion of all water use. Irrigation is one of the few water uses which removes water from the cycle; stream flow is heavily reduced by irrigation, and with it the dilution capacity and the regenerative ability of the stream. The other type of agricultural pollution is from organic wastes and inorganic pesticides and fertilizers finding their way into streams. Some of the newer pesticides are highly toxic and immune to the normal processes of biological decay. The problem of pollution can perhaps be solved by treatment or by outlawing some synthetic preparations; that of depletion by irrigation offers no easy solution. Irrigation water is the life blood of much western agriculture, and agricultural output there will decrease to the extent that irrigation is restricted. On the other hand, there may exist, now or in the future, a point beyond which priority

for agriculture in the use of inadequate supplies of water is no longer economically or socially justifiable.

The conservationist's outlook on water pollution is simple and direct. He is against it. He maintains that anyone who takes clean water out of a stream should put clean water back, regardless of technical difficulty or expense. While associations and societies serve mainly as expressions of a minority viewpoint, state fish and game agencies have a definite function in pollution control, and are empowered in some states to initiate administrative orders or legal action.

With the growth in population, wealth, and leisure, there has come an even greater boom in water based recreation. This has a dual impact on the pollution problem. Bathing, boating, fishing, and similar activities require clean water in varying degrees, from both a sanitary and an aesthetic viewpoint. They all, however, make their own contributions to pollution of the water they use. Recreational interests, in fact, like most users of water, make a basic demand for plenty of clean water, and the freedom to pollute it. In this area, as in the pollution problem as a whole, rapidly increasing demand is coinciding with reduction in supply, as recreational areas are closed through increased pollution.

The ubiquitous part played by water in human living is indicated by the variety of interests involved in restrictions on its use. Hydroelectric power is one of our great economic assets, but damming a river may change its whole character. Acid from a disused mine may destroy all life in miles of stream. Brine from an oil field may have the same effect. Dredging for navigation may cause a serious silting problem elsewhere in the same waterway. All these interests and many others must be taken into account in planning the future of water pollution control and in considering administrative arrangements for it.

Requirements of an Effective State Program

The problem of controlling water pollution is obviously important, and its setting is complex in the variety and depth of the interests involved and in the governmental arrangements that exist to do something about it. The state interest is great, the responsibility of state government is central though not exclusive, and progress towards solving the problem will in very large measure be influenced by the effectiveness of state action.

The present study has sought to develop guidelines for the states with respect to two vital ingredients of a successful state program of water pollution control, people and money. Before reviewing study findings in these respects, it is more than appropriate to identify other important conditions of a successful state program, conditions which will affect productivity in the use of financial resources and qualified workers. These include the legal basis for the program, administrative organization and related arrangements for water pollution control, information adequate to sound planning, and a sound balance in program operations.

The legal basis for water pollution control programs at the state level is found in legislative enactments. It is natural, then, that attention should first focus upon the soundness of the legal basis for the conduct of the programs. The controlling statute should deal with the problem in its broadest context, that of prevention through over-all water resources planning and management. It should define pollution so as to comprehend all possible sources and agencies which may impair the quality of water. It should establish machinery for the effective exercise of preventive control, in the form, among others, of requirements that new or altered facilities which may affect the pollution level shall be brought to the attention and require the approval of the water pollution control agency before rather than after the fact. It should afford means for bringing under effective control those establishments currently operating under the protection of less rigorous standards of the past. Finally, there should be provisions for enforcing compliance with standards affecting sources of pollution and their operation. That the legal foundation is an area deserving attention is suggested by the fact that, at this time, only 37 states have adopted legislation conforming essentially to the model law developed and recommended by the Public Health Service.

Related to and of course influenced significantly by the content of legislation on this subject is the matter of governmental organization for water use and management. This has the two aspects of (1) the number and types of local units and the state's relationships to them, and (2) the distribution of state-level responsibilities within the structure of state government. The number of lesser civil subdivisions having authority over water resources in some way and their autonomy in exercising authority can directly affect the demands upon the state agency responsible for water pollution control and its success in discharging its own program duties. The fragmentation of water resource planning and management duties within the structure of state government imposes additional calls upon administrators for achieving and maintaining interagency coordination. There is, perhaps, no one best organizational arrangement for state water pollution control, but whatever arrangements are adopted should be viewed from the standpoint of their implications for effective use of personnel and laboratory resources by the state agency or agencies involved and for an integrated approach by state and local agencies to the planning, management, and use of water resources.

A third group of ingredients essential to success are those which together comprise a balanced program. There are several such elements. First, there must be provision for securing information as to the nature and characteristics of the problem within the State and keeping that information up-to-date. On the basis of such information, an agency has the raw material from which adequate program planning may proceed in taking account of immediate, urgent needs, the problems of the near future, and those of longer range. There must be a sound balance in the use of the full scope of measures for securing compliance, including informational and educational activities as well as an administrative readiness and legal capability for positive enforcement action when this proves essential. The over-all state program must make adequate provision for continuing surveillance and technical study of streams, inland bodies of water, and coastal waters and for technical review and assistance to municipalities, special districts, and industrial and other water users with respect to present actions and to

those which are proposed. These activities require not only personnel resources but laboratory and field facilities and instrumentation.

The numbers and occupational skills of the staff of the agency are only two dimensions of the personnel requirements for a successful state water pollution control program. The third and in many ways the most important is the quality of administrative leadership and of the technical skills available through the total staffing complement. A related aspect, of increasing importance, is the availability of adequate legal counsel, whether from the state law department, from within the larger organization unit of which the water pollution control agency is a part, or as a part of the agency's own personnel. The determinants of personnel quality include not only the level of compensation as a basic element but also aggressiveness of recruitment measures, the efficacy of selection practices, and the general personnel and administrative environment of the agency.

Personnel and Budgetary Guidelines

The central purpose of this study has been to develop standards against which state agencies and others interested may gauge the adequacy of personnel complements and budgetary support for state water pollution control programs. The use of standards or criteria, however arbitrary and imperfect, is increasing in all phases of human activity and in connection with many governmental policy and management determinations. Common today are such measures as numbers of pupils per teacher and policemen, public health nurses, or acres of park area per thousand persons, and the like. Most of these have evolved over a period of many years and have involved research in extensive data and testing through many conferences and applications. They serve a useful purpose in providing general information and some guidance. To date, however, they fall far short in the aggregate of settling the perpetual competition among functions for the same taxpayer dollar and individually they are still much less than precise and universally applicable norms.

Criteria for Guidelines

The selection of criteria to determine personnel and budgetary needs is always difficult, and particularly on the basis of a limited survey. Those selected should, however, satisfy certain principles. Obviously, they should measure need. They should reflect changes in need. They should be based upon authoritative data which do not lend themselves to self-serving manipulation. Above all, perhaps, they must be relatively simple if only because there still are no foundations for a technically refined, "scientific" approach in detail.

For the purposes of the present study, factors conforming to these principles include total state population, population density, percentage of urbanization, recreational use, industrialization, wet industries, and municipal facilities classified as primary or secondary treatment plants or simply as sewage collector systems without treatment. Certain other pertinent data, including miles of streams and shoreline, project plans and permits reviewed, and the like, were not available for all states and therefore could not be used. The use of surface or groundwater for municipal water supplies, while related closely to water pollution control, could be considered only through the use of urbanization as one of the criteria.

Special factors bear upon personnel and budgetary requirements in varying numbers of states. These include such less common problems as acid mine drainage, oil field brine, paper and pulp wastes, and the like, and the policy of some states to provide financial assistance to local units in the construction of control facilities. Nearly every state has special problems of its own which are not accounted for by measures of personnel and budgetary requirements which meet the principles applicable to the selection of criteria of need.

The weighting of the available factors also poses special problems. Even though the criteria and the values placed upon them have been tested against observations of programs in a number of states and the informed judgments of experienced, practicing administrators at state and federal levels, in the final analysis each state must apply with discriminating judgment the findings of this study. The limitations that surround the criteria and their assigned values are such that they must be regarded as

guidelines for staffing and budgetary determinations rather than as precise measurements of adequacy in these respects.

The development of staffing and budgetary guidelines through the present study required that attention be given first to personnel needs, for these needs are the principal element in state expenditures in water pollution control programs. It proved possible, on the basis of information obtainable through the study, to deal with staff needs for facility service separately from those for other program phases. This separation seemed strongly desirable, because of the directness with which it was possible to relate facility surveillance personnel needs to information as to the numbers and types of facilities and to a considerable body of experience as to the staff time required to give attention to them for purposes of water pollution control. General staff needs, however, had to be measured by more general criteria.

The sections of the report that immediately follow deal with general staff needs, facility staff needs, the translation of needs in terms of numbers of workers into statements of budgetary needs, and the distribution of needed staff among occupational and functional groupings.

General Staff Requirements

Measures of needed personnel for activities other than facility service included population factors, land and water area, recreational use, and industrialization. Basic criteria data for these measures are presented in Tables 1 and 2. The use of these indicators required the assignment of values. This was first done on an *a priori* basis, and the results were tested against judgments of experienced program administrators and consideration of program performance, with adjustments made on the basis of this testing process.

Data relating to population (P) used as an indicator of general staff requirements included total state population, population density per square mile, and the degree (percentage) of urbanization as defined by the Bureau of the Census. Area (A) indicators included land and water area. Recreational use (U) took account of water contact sports and was measured in terms of fishing licenses and boat registrations, expressed together as

Table 1

POPULATION, AREA, RECREATIONAL USE, AND INDUSTRIAL EMPLOYMENT DATA
ALL STATES

State and Population Group	Population			Area (1,000 Square Miles)		Recreational Use				Industrial Workers	
	Total (1,000's)	Per Square Mile	Per Cent Urbanized[b/]	Land	Water	Fishing Licenses (1,000's)	Boating Registration (1,000's)	Total (1,000's)	Per Cent of Population	Total (1,000's)	Per Cent of Population
Under 500,000											
Alaska	248	0.4	38	571	15.3	57	14	71	28.6	5	2.0
Delaware	476	240.7	66	2	0.4	11	10	21	4.4	58	12.2
Nevada	368	3.4	70	110	0.8	72	9	81	22.0	5	1.4
Vermont[a/]	390	42.0	39	9	0.3	102	18	120	30.8	36	9.2
Wyoming	337	3.5	57	97	0.5	137	4	141	42.0	7	2.1
500,000 to 1,000,000											
Hawaii	694	108.2	77	6	--	4	6	10	1.4	23	3.3
Idaho	713	8.6	48	83	0.8	240	23	263	37.0	29	4.1
Maine	982	31.7	51	31	1.3	230	15	245	25.0	102	10.4
Montana[a/]	707	4.9	50	146	1.4	231	12	243	34.4	19	2.7
New Hampshire	627	69.6	58	9	0.3	129	4	133	21.2	81	12.9
North Dakota	634	9.1	35	69	1.2	54	6	60	9.6	6	0.9
Rhode Island[a/]	885	836.5	86	1	0.2	22	17	39	4.4	119	13.5
South Dakota[a/]	737	9.7	39	76	0.7	152	10	162	22.0	14	1.9
Utah	983	11.9	75	82	2.6	186	14	200	20.4	50	5.1
1,000,000 to 3,000,000											
Arizona	1,559	13.7	75	114	0.3	283	21	304	19.6	51	3.3
Arkansas	1,858	35.4	43	52	0.6	457	15	472	25.3	114	6.1
Colorado	1,961	18.9	74	104	0.4	417	12	429	21.9	99	5.1
Connecticut	2,666	544.2	78	5	0.7	108	33	141	5.2	418	15.7
Iowa	2,780	49.6	53	56	0.3	420	44	464	16.7	173	6.2
Kansas[a/]	2,225	27.1	61	82	0.2	272	22	294	13.2	114	5.1
Mississippi	2,290	48.5	38	47	1.0	292	3	295	12.9	120	5.2
Nebraska	1,460	19.1	54	77	0.6	221	19	240	16.5	63	4.3
New Mexico	1,018	8.4	66	122	0.2	145	14	159	15.7	14	1.4
Oklahoma	2,487	36.1	63	69	1.0	465	66	531	21.3	92	3.7
Oregon[a/]	1,826	19.0	62	96	0.8	666	50	716	39.3	143	7.8
South Carolina	2,483	82.0	41	30	0.9	303	48	351	14.1	253	10.2
West Virginia[a/]	1,778	73.8	38	24	0.1	251	9	260	14.6	112	6.3

Table 1 (continued)

State and Population Group	Population			Area (1,000 Square Miles)		Recreational Use				Industrial Workers	
	Total (1,000's)	Per Square Mile	Per Cent Urbanized[b]	Land	Water	Fishing Licenses (1,000's)	Boating Registration (1,000's)	Total (1,000's)	Per Cent of Population	Total (1,000's)	Per Cent of Population
3,000,000 to 5,000,000											
Alabama	3,347	65.6	55	51	1.1	546	77	623	18.6	235	7.0
Georgia	4,140	71.0	55	58	0.7	497	55	552	13.4	328	7.9
Indiana[a]	4,694	129.7	62	36	0.3	760	105	865	18.4	597	12.7
Kentucky[a]	3,095	77.6	45	40	0.5	317	57	374	12.1	176	5.7
Louisiana	3,418	75.8	63	45	4.4	225	70	295	8.6	130	3.8
Maryland	3,289	333.1	73	10	2.4	112	54	166	5.0	252	7.7
Minnesota	3,500	43.8	62	80	6.3	1,309	188	1,497	42.8	238	6.8
Missouri	4,328	62.6	67	69	0.5	885	54	939	21.7	383	8.9
North Carolina[a]	4,760	97.0	40	49	3.6	477	57	534	11.2	510	10.7
Tennessee	3,694	88.5	52	42	0.5	888	55	943	25.6	318	8.6
Virginia	4,331	108.7	56	40	1.0	508	42	550	12.7	296	6.8
Washington	3,050	45.7	68	67	2.9	378	78	456	15.0	231	7.6
Wisconsin	4,061	74.2	64	55	11.5	1,071	218	1,289	31.7	470	11.6
5,000,000 to 10,000,000											
Florida[a]	5,652	104.0	74	54	6.0	521	217	738	13.0	200	3.5
Massachusetts	5,218	663.3	84	8	1.3	146	80	226	4.3	717	13.7
Michigan[a]	8,116	142.3	73	57	39.8	1,115	315	1,430	17.6	937	11.5
New Jersey	6,470	860.3	89	8	0.7	216	96	312	4.8	805	12.4
10,000,000 to 15,000,000											
Illinois	10,182	182.1	81	56	2.0	706	153	859	8.4	1,194	11.7
Ohio	10,173	248.3	73	41	3.7	822	144	966	9.5	1,223	12.0
Pennsylvania[a]	11,424	253.8	72	45	1.1	602	46	648	5.7	1,409	12.3
Texas[a]	10,323	39.3	75	263	4.5	833	167	1,000	9.7	497	4.8
Over 15,000,000											
California	17,590	112.3	86	157	2.2	3,496	288	3,784	21.5	1,359	7.7
New York	17,708	369.4	85	48	6.0	727	349	1,076	6.1	1,906	10.8

Sources: Population--U.S. Department of Commerce, Bureau of the Census, July 1, 1963, Estimates. Area--Statistical Abstract of the U.S., 1961, Department of Commerce, Bureau of the Census, pp. 161 and 162. Recreational Use--Fishing Licenses, 1962, U.S. Department of the Interior, Fish and Wildlife News Service, May 12, 1963; Boating Registration, 1963, Recreational Boating in the U.S., Treasury Department, Coast Guard Service. Industrial Workers--1962 Annual Survey of Manufactures, U.S. Department of Commerce, Bureau of the Census.

[a] Indicates states visited.

[b] 1960.

Table 2

MUNICIPAL SEWAGE TREATMENT PLANTS, WET INDUSTRIES,
AND SEWERAGE SYSTEMS WITHOUT TREATMENT
ALL STATES

State and Population Group	Municipal Treatment Plants		Wet Industries	Sewerage Systems without Treatment
	Primary	Secondary		
Under 500,000				
Alaska	1	--	112	20
Delaware	11	2	326	3
Nevada	7	26	82	4
Vermont[a/]	13	1	300	38
Wyoming	9	51	138	11
500,000 to 1,000,000				
Hawaii	8	9	289	10
Idaho	38	26	350	27
Maine	14	3	804	92
Montana[a/]	34	72	322	8
New Hampshire	9	10	630	59
North Dakota	33	137	219	15
Rhode Island	7	8	1,518	7
South Dakota[a/]	36	123	267	22
Utah	19	36	523	20
1,000,000 to 3,000,000				
Arizona	17	52	494	5
Arkansas	73	64	817	24
Colorado	34	115	1,057	27
Connecticut	51	31	3,122	9
Iowa	33	339	1,960	66
Kansas[a/]	38	284	1,255	13
Mississippi	35	83	793	50
Nebraska	44	181	850	75
New Mexico	5	70	285	1
Oklahoma	37	239	1,293	8
Oregon[a/]	51	95	1,319	19
South Carolina	111	64	1,036	46
West Virginia[a/]	32	14	644	130
3,000,000 to 5,000,000				
Alabama	69	75	1,345	72
Georgia	113	86	2,168	77
Indiana[a/]	41	149	3,486	131
Kentucky[a/]	33	79	1,140	49
Louisiana	11	116	1,411	34

Table 2 (continued)

State and Population Group	Municipal Treatment Plants		Wet Industries	Sewerage Systems without Treatment
	Primary	Secondary		
Maryland	32	21	1,594	19
Minnesota	85	259	2,634	60
Missouri	24	342	3,080	100
North Carolina[a/]	128	127	2,932	104
Tennessee	42	70	1,817	23
Virginia	71	107	1,462	53
Washington	89	104	1,723	37
Wisconsin	116	270	4,663	6
5,000,000 to 10,000,000				
Florida[a/]	86	242	2,412	18
Massachusetts	33	52	6,389	59
Michigan[a/]	114	99	8,055	23
New Jersey	66	137	7,200	7
10,000,000 to 15,000,000				
Illinois	74	370	9,691	28
Ohio	129	222	8,929	90
Pennsylvania[a/]	121	263	9,755	298
Texas[a/]	116	709	5,244	7
Over 15,000,000				
California	107	377	13,349	22
New York	259	148	16,553	141

Source: Treatment plants and sewerage systems with no treatment--Statistical Summary of 1962 Inventory Municipal Waste Facilities in the U. S., U. S. Department of HEW, PHS., pp. 10 and 11. Wet Industries--Basic Data Tables for Grant-in-Aid Allocation, Fiscal Year 1965, U. S. Department of HEW, PHS., April, 1964.

[a/] Indicates states visited.

a percentage of state population. Industrialization (M) was measured in terms of total workers employed in manufacturing industries of the state expressed as a percentage of the total state population.

Point scores were assigned to these factors for each state in each of the several population groups in the manner indicated below:

Code	Parameter	Basis	Maximum Points Allowable
P	Total population	20 points for most populous state in class, with generally uniform distribution downwards from 20 points related to difference in population between most and least populous states.	20
	Population density	1 point per 30 persons per square mile	10
	Per cent urbanization	1 point for each 5 per cent of population urbanized over 35 per cent	10
A	Land Area	1 point per 15,000 square miles	10
	Water Area	1 point per 500 square miles	10
U	Recreational Use	1 point per each 2.5 per cent of state population represented by sum of numbers of fishing licenses and boat registrations.	20
M	Industrial Use	1 point per each 0.75 per cent of state population represented by number of workers in manufacturing industry.	20

Point scores for each state within each population class were determined on the basis outlined above. The total point score of the median state was taken as unity (1.0) and the point scores of the other states in the class were then converted to a comparison index (C.I.) on this same scale. The comparison index numbers so obtained were used to compute individual state general staff requirements for all states in the population group for both a minimum and a desirable program. The index numbers were applied to estimates of minimum and desirable general staff needs made by program administrators in the states visited, adjusted to take account of judgments by informed persons as to the validity of those

estimates. These steps were followed for all six of the population classes, and by extrapolation were applied to California and New York (neither of which was visited) to arrive at minimum and desirable base or general staff requirements for each state. These are set forth in Table 3. It is to be noted that the comparison index figures are applicable only within a population class.

Facility Service Staff Requirements

Whereas the criteria used to calculate the general staffing requirements for each state was on a comparison basis, the determination of staffing needs for facility service was computed on an absolute scale. This resulted from the availability of nationwide data which could be translated directly into manpower requirements. These data consisted of the number of waste water treatment plants, primary and secondary, the number of wet industries, and the number of sewerage facilities discharging untreated wastes, tabulated by state. Unfortunately, data on the number of private and institutional facilities requiring state surveillance were not available nationally.

In order to use the data described above and tabulated in Table 2, staff ratios were developed on an *a priori* basis and adjusted to take account of survey field findings. The basis for determining staff ratios for an adequate facility surveillance program is outlined below:

Table 3

MINIMUM AND DESIRABLE STAFFING NEEDS
FOR STATE WATER POLLUTION CONTROL AGENCIES
BY STATES AND POPULATION GROUPS
1964

State and Population Group	General Staff											
	Points					Comparison Index	Staff		Facility Surv. Staff		Total Staff	
	P	A	U	M	Total		Min.	Des.	Min.	Des.	Min.	Des.
Under 500,000												
Alaska	6	20	11	3	40	0.95	14.2	23.8	0.8	1.2	15	25
Delaware	34	1	2	16	53	1.26	18.9	31.5	1.3	2.0	20	34
Nevada	20	9	9	2	40	0.95	14.2	23.8	0.9	1.7	15	26
Vermont[a/]	16	2	12	12	42	1.00	15.0	25.0	1.9	3.0	17	28
Wyoming	15	7	17	3	42	1.00	15.0	25.0	1.8	3.2	17	28
500,000 to 1,000,000												
Hawaii	17	0	1	4	22	0.58	10.4	15.2	1.4	2.3	12	17
Idaho	9	8	15	6	38	1.00	18.0	26.0	2.6	4.4	21	30
Maine	24	9	10	14	57	1.50	27.0	39.0	4.7	7.2	32	46
Montana[a/]	9	13	14	4	40	1.05	18.9	27.3	3.0	5.4	22	33
New Hampshire	9	2	8	17	36	0.95	17.1	24.7	3.6	5.5	21	30
North Dakota	2	7	4	1	14	0.37	6.7	9.6	4.1	7.7	11	17
Rhode Island	35	0	2	18	55	1.44	25.9	37.4	5.4	8.3	31	46
South Dakota[a/]	8	6	9	3	26	0.68	12.2	17.7	4.1	7.6	16	25
Utah	28	10	8	7	53	1.40	25.2	36.4	3.0	5.0	28	41
1,000,000 to 3,000,000												
Arizona	16	9	8	4	37	1.00	21.0	30.0	3.0	5.0	24	35
Arkansas	14	4	10	8	36	0.97	20.4	29.1	5.2	8.8	26	38
Colorado	21	8	9	7	45	1.21	25.4	36.3	6.7	11.5	32	48
Connecticut	37	1	2	20	60	1.62	34.0	48.5	11.7	18.2	46	67
Iowa	26	5	7	8	46	1.24	26.0	37.2	15.0	26.0	41	63
Kansas[a/]	20	5	5	7	37	1.00	21.0	30.0	10.5	18.7	32	49
Mississippi	18	5	5	7	35	0.95	20.0	28.5	5.7	9.5	26	38
Nebraska	12	6	7	6	31	0.84	17.7	25.2	8.4	14.5	26	40
New Mexico	8	8	6	2	24	0.65	13.6	19.5	2.4	4.4	16	24
Oklahoma	24	7	9	5	45	1.21	25.4	36.3	9.6	17.0	35	53
Oregon[a/]	16	8	16	10	50	1.35	28.3	40.5	7.1	12.0	35	53
South Carolina[a/]	21	4	5	14	44	1.19	25.0	35.7	6.7	11.4	32	47
West Virginia[a/]	13	2	6	8	29	0.78	16.4	23.4	5.3	8.3	22	32
3,000,000 to 5,000,000												
Alabama	11	5	7	9	32	0.78	25.0	45.2	8.1	13.3	33	59
Georgia	19	5	5	11	40	0.98	31.4	57.0	11.6	18.9	43	76
Indiana[a/]	28	3	7	17	55	1.34	42.9	77.7	17.6	28.2	61	106
Kentucky[a/]	7	4	5	8	24	0.59	18.9	34.2	6.7	11.0	26	45

Table 3 (continued)

State and Population Group	General Staff Points P	A	U	M	Total	Comparison Index	General Staff Staff Min.	Des.	Facility Surv. Staff Min.	Des.	Total Staff Min.	Des.
Louisiana	14	12	3	5	34	0.83	26.6	48.2	7.8	12.9	34	61
Maryland	23	6	2	10	41	1.00	32.0	58.0	6.4	10.0	38	68
Minnesota	13	15	17	9	54	1.32	42.3	76.5	16.2	27.0	58	104
Missouri	23	6	9	12	50	1.22	39.0	70.8	19.3	32.6	58	103
North Carolina[a/]	24	10	4	14	52	1.27	40.6	73.6	15.6	25.4	56	99
Tennessee	15	4	10	11	40	0.98	31.4	56.9	8.3	13.4	40	70
Virginia	23	5	5	9	42	1.02	32.6	59.1	8.8	14.6	41	74
Washington	10	12	6	10	38	0.93	29.8	53.9	9.4	15.7	39	70
Wisconsin	21	14	13	15	63	1.53	49.2	89.4	22.2	36.6	71	126
5,000,000 to 10,000,000												
Florida[a/]	14	14	5	5	38	0.76	44.1	68.5	14.1	24.0	58	93
Massachusetts	21	4	2	18	45	0.90	52.2	81.0	23.8	36.4	76	117
Michigan[a/]	33	14	7	15	69	1.38	80.0	124.0	30.4	47.2	110	171
New Jersey	29	2	2	17	50	1.00	58.0	90.0	27.5	43.0	86	133
10,000,000 to 15,000,000												
Illinois	22	8	3	16	49	0.92	92.0	138.0	41.0	65.6	133	204
Ohio	23	10	4	16	53	1.00	100.0	150.0	37.3	58.8	137	209
Pennsylvania[a/]	35	5	2	16	58	1.10	110.0	165.0	45.0	70.7	155	236
Texas[a/]	18	19	4	6	47	0.89	89.0	133.5	33.0	57.1	122	191
Over 15,000,000												
California	34	14	9	10	67	1.26	126.0	189.0	53.6	84.6	180	274
New York	40	13	2	14	69	1.30	130.0	195.0	63.6	98.1	194	293

Note: General staff data from Table 1. Facility surveillance staff data from Table 2.

[a/] Indicates states visited.

Point Code

P--Population
A--Area
U--Recreational use
M--Industrial workers

Abbreviations

Min.--Minimum
Des.--Desirable
Surv.--Surveillance

Item	Minimum Program: Average Inspection Frequency and Man-Days Staff Time	Minimum Program: Staff Ratio	Desirable Program: Average Inspection Frequency and Man-Days Staff Time	Desirable Program: Staff Ratio
Municipal Treatment Plants--Secondary	2/yr. at 2 days	1/50	4/yr. at 2 days	1/25
Municipal Treatment Plants--Primary	2/yr. at 1 day	1/100	4/yr. at 1 day	1/50
Sewerage Systems[a/] Without treatment	4/yr. at 1 day	1/50	6/yr. at 1 day	1/33
Wet Industries[b/]	Major--2/yr. at 2 days Minor--1/yr. at 1 day	1/300	Major--4/yr. at 2 days Minor--1/yr. at 1 day	1/200

[a/] Contact to encourage construction of treatment plants or sewerage facilities.

[b/] It was assumed that of every 100 wet industries, only 40 are a responsibility of the state agency and that the 40 include 10 major and 30 minor facilities.

It should be noted that the assumptions have been made, in connection with facility service staff needs, that such staff would carry out training and licensing responsibility and that the staff ratios reflect average conditions. The staff ratios for facility service described above were used to compute personnel requirements beyond those for general program needs. The results of these computations are presented in Table 3.

Since staffing requirements for facility service were arrived at on the basis of an assumed inspection frequency along with a fixed number of municipal treatment plants and wet industries, it follows that the results are somewhat independent of the state population groups. The computed over-all range is from 0.8 man-years to 98.1 man-years. This spread attests to the wide range of staffing requirements among the 50 state water pollution control agencies.

Stream Surveillance Requirements

It proved impossible to generalize relative to staff requirements for stream surveillance owing to the wide variation in conditions encountered among the 50 states. Actually many states do not even have an inventory of the total miles of streams within their boundaries. Increased mechanization of stream surveillance, as done by the Ohio River Valley Water Sanitation Commission in the case of the Ohio River, may influence personnel requirements in the future.

Determination of Budgetary Guidelines

Total proposed staffing requirements for both minimum and desirable levels of program activity were developed by adding the general staff needs to facility service staff requirements as computed for each state. These staffing ranges constituted a principal basis for the determination of budgetary requirements.

Survey field work extended to the collection of information on annual salaries of present staffs, recruiting and turnover experience, and levels of professional qualifications. It was clear that some states experienced notable difficulties with high turnover, high vacancy ratios, and the recruitment of professional staff. In examining state experience with such difficulties it became apparent that the states with the most serious problems were those whose average staff salaries fell appreciably below three times the national average per capita spendable income ($2,283 in 1962). This was not surprising, for the labor market for professional and technical staff suited to the needs of an effective water pollution control agency is, subject to limited regional differences, essentially a national market.

Accordingly, to convert computed staff requirements to personal service requirements in monetary amounts, three times the per capita annual income for the state or for the nation as a whole, whichever was higher, was used as the annual average salary per employee required for minimum and for desirable program levels.

Survey field work also produced considerable information as to nonpersonal service budgetary needs of the individual states. The survey findings also emphasized the variations in particular features of state programs (such as participation in interstate water pollution control activities, contributions to special studies, capital outlay programs to assist local governments, and the like). These variations were such that it was impossible to take such special program features into account in any meaningful way. However, survey findings indicated that typically about 75 per cent of the average state water pollution control budget was made up of personal services costs. On the basis of this experience,

budgetary requirements for supplies, materials, and services were estimated at one-third (33 per cent) of computed budgetary requirements for personal services. The accompanying Table 4 summarizes the results of estimates and computations regarding staff and budgetary requirements, and expresses these for each state in total amounts and in budgetary requirements per capita.

Occupational Distribution of Needed Staff

The present project also included an attempt to express staffing guidelines by major occupational categories as well as by total numbers needed. Accordingly, survey work was directed at securing information on which such an occupational distribution could be based, and information as to staffing needs in these terms was also secured from the 13 states visited during the course of the survey.

Practice and judgments were found to vary considerably. Data secured through the survey indicated, however, that in general the states with the smallest staffs have the highest ratios of professional to nonprofessional personnel. The staffing guidelines produced through this study and already presented indicate that most states need larger staffs to carry out minimum as well as desirable pollution control programs. It seems highly probable that as such staffing objectives are approached increased opportunities will be available for more extensive use of support personnel (nonprofessionals including clerical employees, inspectors, engineering aides and technicians, and laboratory assistants).

The present ratio of nonprofessional staff to total staff among the 13 states canvassed ranges from a low of 15 per cent to a high of 51 per cent, with an average of about 26 per cent. Because the guidelines as to staffing contemplate increases in total personnel, whether for minimum or for desirable programs, and because it is evident that the larger staffs permit relatively greater use of nonprofessionals, 31 per cent has been taken as an appropriate ratio of nonprofessional to total staff.

Efforts were made to achieve further refinements of the distribution of needed personnel. Analysis of data relative to needs in terms of

the several professional disciplines (sanitary engineers, chemists, biologists, attorneys, and the like) produced no discernible pattern, and accordingly it was concluded that distribution of needed staff among these classes was not feasible. Attention then was turned to an analysis of staff composition by functional grouping. This analysis took account of computed total staff needs as arrived at through the present study and the judgments of experienced administrators as to the distribution of staff needs among several functional groupings, with the latter modified on the basis of informal evaluations of programs and operations. The results of this analysis are presented in the following tabulation.

PERCENTAGE OF STAFF BY FUNCTION (RANGE AND AVERAGE) BY POPULATION GROUP

Function	Population Group					
	1	2	3	4	5	6
General Administration	20-25	17-35	10-30	12-16	11-16	5-20
Average	23	25	17	14	14	15
Legal Services	1-2	1-8	1-4	1-9	1-5	1-4
Average	2	4	2	3	3	2
Water Quality	35-45	8-35	14-47	20-46	34-40	14-48
Average	42	24	27	32	35	33
Engineering Service	20	6-50	9-27	14-46	18-39	20-41
Average	20	24	19	31	27	[illegible]
Facility Service	12-15	15-33	14-65	10-26	3-28	[illegible]-35
Average	13	23	35	20	21	24

It is to be noted that, with the exception of legal services, the major professional disciplines represented in water pollution control programs tend to bridge the several functional groupings. Two significant features characterize data in the foregoing tabulation of staff needs by function. First, there is a decreasing need in relative terms for general administration

Table 4

PERSONAL SERVICES AND TOTAL AND PER CAPITA BUDGETS
FOR STATE WATER POLLUTION CONTROL AGENCIES
BY STATES AND POPULATION GROUPS
1964

State and Population Group	Total Staff[b] Minimum	Total Staff[b] Desirable	Average Annual Salary	Budget--$1,000's Personal Services Minimum	Personal Services Desirable	Total Minimum	Total Desirable	Per Capita Budget Minimum	Per Capita Budget Desirable
Under 500,000									
Alaska	15	25	$8,088	$ 121	$ 202	$ 161	$ 268	$0.65	$1.08
Delaware	20	34	9,108	182	310	242	412	0.51	0.87
Nevada	15	26	8,943	134	232	178	308	0.48	0.84
Vermont[a]	17	28	6,849	117	192	156	255	0.40	0.65
Wyoming	17	28	6,849	117	192	156	255	0.46	0.76
500,000 to 1,000,000									
Hawaii	12	17	7,035	84	119	112	158	0.16	0.23
Idaho	21	30	6,849	144	206	192	274	0.27	0.38
Maine	32	46	6,849	219	315	291	419	0.30	0.43
Montana[a]	22	33	6,849	151	226	201	301	0.28	0.43
New Hampshire	21	30	6,849	144	206	192	274	0.31	0.44
North Dakota	11	17	6,849	75	117	100	156	0.16	0.25
Rhode Island	31	46	6,849	212	315	282	418	0.32	0.47
South Dakota[a]	16	25	6,849	110	171	146	228	0.20	0.31
Utah	28	41	6,849	192	281	256	374	0.26	0.38
1,000,000 to 3,000,000									
Arizona	24	35	6,849	165	240	220	319	0.14	0.20
Arkansas	26	38	6,849	178	260	237	346	0.13	0.19
Colorado	32	48	6,996	224	336	298	447	0.15	0.23
Connecticut	46	67	8,904	410	596	545	793	0.20	0.30
Iowa	41	63	6,849	281	431	374	574	0.13	0.21
Kansas[a]	32	49	6,849	219	336	291	447	0.13	0.20
Mississippi	26	38	6,849	178	260	237	346	0.10	0.15
Nebraska	26	40	6,849	178	274	237	364	0.16	0.25
New Mexico	16	24	6,849	110	165	146	220	0.14	0.22
Oklahoma	35	53	6,849	240	363	319	483	0.13	0.19
Oregon[a]	35	53	6,849	240	363	319	483	0.17	0.26
South Carolina	32	47	6,849	219	322	292	429	0.12	0.17
West Virginia[a]	22	32	6,849	151	219	201	291	0.11	0.16

Table 4 (continued)

State and Population Group	Total Staff[b] Minimum	Total Staff[b] Desirable	Average Annual Salary	Budget--$1,000's Personal Services Minimum	Personal Services Desirable	Total Minimum	Total Desirable	Per Capita Budget Minimum	Per Capita Budget Desirable
3,000,000 to 5,000,000									
Alabama	33	59	$6,849	$ 226	$ 404	$ 300	$ 537	$0.09	$0.16
Georgia	44	76	6,849	294	520	392	692	0.10	0.17
Indiana[a]	61	106	6,849	418	726	556	965	0.12	0.21
Kentucky[a]	26	45	6,849	178	308	237	410	0.08	0.13
Louisiana	34	61	6,849	234	419	311	556	0.09	0.16
Maryland	38	68	7,605	289	517	384	688	0.12	0.21
Minnesota	58	104	6,849	398	712	530	946	0.15	0.27
Missouri	58	103	6,861	398	707	530	940	0.12	0.22
North Carolina	56	99	6,849	384	679	510	903	0.11	0.19
Tennessee	40	70	6,849	274	480	364	638	0.10	0.17
Virginia	41	74	6,849	281	506	374	673	0.09	0.16
Washington	39	70	7,143	278	500	370	666	0.12	0.22
Wisconsin	71	126	6,849	486	862	646	1,145	0.16	0.28
5,000,000 to 10,000,000									
Florida[a]	58	93	6,849	397	637	528	847	0.09	0.15
Massachusetts	76	117	7,929	602	928	800	1,235	0.15	0.24
Michigan[a]	110	171	7,017	771	1,200	1,025	1,600	0.13	0.20
New Jersey	86	133	8,319	715	1,110	950	1,475	0.15	0.23
10,000,000 to 15,000,000									
Illinois	133	204	8,202	1,090	1,673	1,450	2,225	0.14	0.22
Ohio	137	209	7,047	965	1,470	1,285	1,960	0.13	0.19
Pennsylvania[a]	155	236	6,903	1,070	1,630	1,420	2,170	0.12	0.19
Texas[a]	122	191	6,849	835	1,310	1,110	1,740	0.11	0.17
Over 15,000,000									
California	180	274	8,418	1,515	2,310	2,015	3,070	0.11	0.17
New York	194	293	8,538	1,655	2,500	2,200	3,320	0.12	0.19

[a] Indicates states visited.

[b] From Table 3.

staff as the agency becomes larger in total personnel, and, second, there is a slight relative increase in staff needs for facility service in moving upwards through the several population classes from small to large. Even these, however, are not entirely consistent. Accordingly, it proved possible to list, but only for general guidance purposes, the distribution of staff needs among functions, as follows:

Function	General Range of Staff Percentages	Adjusted Average
General Administration	15 to 25	20
Legal Services	2 to 10	5
Water Quality	25 to 40	30
Project and Program Service	20 to 40	25
Facility Service	15 to 30	20
Total		100

There is presented in Table 5, a grouping of states by computed minimum and desirable per capita budget requirements. Table 6 summarizes staffing, adjusted average salary, and total and per capita budgets as computed for the individual states, listed in alphabetical order.

Summary of Staff and Budget Guideline Data

Through the processes which have been outlined above, it has proved possible to develop measures of minimum and desirable staffing needs, for facility service, and for general program needs, and to combine these into over-all statements of staffing requirements for all states. It was not, however, possible to translate stream surveillance into staffing requirements related to this functional area, and consequently needs for this function are included in the estimates of staff requirements for general program purposes. It has further been feasible to provide budgetary guidelines which cover the basic ingredients of personal services costs and outlays for supporting materials, supplies, and services. While it was discovered that there is an inadequate basis

Table 5

GROUPING OF STATES BY MINIMUM AND DESIRABLE
PER CAPITA BUDGET REQUIREMENTS
FOR STATE WATER POLLUTION CONTROL AGENCIES
1964

States	Per Capita Budget (Cents)		States in Group
	Minimum	Desirable	
Alaska, Delaware, Nevada, Vermont, Wyoming	40-65	65-108	5
Connecticut, Idaho, Maine, Montana, New Hampshire, Rhode Island, South Dakota, Utah	20-39	41-65	8
Arizona, Colorado, Hawaii, Illinois, Massachusetts, Minnesota, Nebraska, New Jersey, New Mexico, North Dakota, Oregon, Wisconsin	14-17	20-28	12
Arkansas, Indiana, Iowa, Kansas, Maryland, Michigan, Missouri, New York, Ohio, Oklahoma, Pennsylvania, South Carolina, Washington	12-13	17-22	13
California, Georgia, Mississippi, North Carolina, Tennessee, Texas, West Virginia	10-11	15-19	7
Alabama, Florida, Kentucky, Louisiana, Virginia	8-9	13-16	5

Source: Table 4.

Table 6

SUMMARY OF COMPUTED STAFFING AND BUDGET NEEDS
FOR STATE WATER POLLUTION CONTROL AGENCIES
1964

Pop. Group	State	Staffing: Fac. Surv. Min.	Fac. Surv. Des.	Other Min.	Other Des.	Total Min.	Total Des.	Adjusted Average Salary	Budget--$1,000's: Pers. Serv. Min.	Pers. Serv. Des.	Total Min.	Total Des.	Total Budget Per Capita-¢ Min.	Per Capita-¢ Des.
4	Alabama	8	13	25	46	33	59	$6,849	$ 226	$ 404	$ 300	$ 537	9	16
1	Alaska	1	1	14	24	15	25	8,088	121	202	161	268	65	108
3	Arizona	3	5	21	30	24	35	6,849	165	240	220	319	14	20
3	Arkansas	5	9	21	29	26	38	6,849	178	260	237	346	13	19
7	California	54	85	126	189	180	274	8,418	1,515	2,310	2,015	3,070	11	17
3	Colorado	7	12	25	36	32	48	6,996	224	336	298	447	15	23
3	Connecticut	12	18	34	49	46	57	8,904	410	596	545	793	20	30
1	Delaware	1	2	19	32	20	34	9,108	182	310	242	412	51	87
5	Florida	14	24	44	69	58	93	6,849	397	637	528	847	9	15
4	Georgia	12	19	31	57	43	76	6,849	294	520	392	692	10	17
2	Hawaii	1	2	11	15	12	17	7,035	184	119	112	158	16	23
2	Idaho	3	4	18	26	21	30	6,849	144	206	192	274	27	38
6	Illinois	41	66	92	138	133	204	8,202	1,090	1,673	1,450	2,225	14	22
4	Indiana	18	28	43	78	61	106	6,849	418	726	556	965	12	21
3	Iowa	15	26	26	37	41	63	6,849	281	431	374	574	13	21
3	Kansas	11	19	21	30	32	49	6,849	219	336	291	447	13	20
4	Kentucky	7	11	19	34	26	45	6,849	178	308	237	410	8	13
4	Louisiana	8	13	26	48	34	61	6,849	234	418	311	556	9	16
2	Maine	5	7	27	39	32	46	6,849	219	315	291	419	30	43
4	Maryland	6	10	32	58	38	68	7,605	289	517	384	688	12	21
5	Massachusetts	24	36	52	81	76	117	7,929	602	928	800	1,235	15	24
5	Michigan	30	47	80	124	110	171	7,017	771	1,200	1,025	1,600	13	20
4	Minnesota	16	27	42	77	58	104	6,849	398	712	530	946	15	27
3	Mississippi	6	10	20	28	26	38	6,849	178	260	237	346	10	15
4	Missouri	19	32	39	71	58	103	6,861	398	707	530	940	12	22
2	Montana	3	5	19	28	22	33	6,849	151	226	201	301	28	43
3	Nebraska	8	15	18	25	26	40	6,849	178	274	237	364	16	25
1	Nevada	1	2	14	24	15	26	8,943	134	232	178	308	48	84
2	New Hampshire	4	5	17	25	21	30	6,849	144	206	192	274	31	44
5	New Jersey	28	43	58	90	86	133	8,319	715	1,110	950	1,475	15	23

Table 6 (continued)

Pop. Group	State	Staffing: Fac. Surv. Min.	Fac. Surv. Des.	Other Min.	Other Des.	Total Min.	Total Des.	Adjusted Average Salary	Budget--$1,000's: Pers. Serv. Min.	Pers. Serv. Des.	Total Min.	Total Des.	Total Budget Per Capita-¢ Min.	Des.
3	New Mexico	2	4	14	20	16	24	$6,849	$ 110	$ 165	$ 146	$ 220	14	22
7	New York	64	98	130	195	194	293	8,538	1,655	2,500	2,200	3,320	12	19
4	North Carolina	15	25	41	74	56	99	6,849	384	679	510	903	11	19
2	North Dakota	4	8	7	9	11	17	6,849	75	117	100	156	16	25
6	Ohio	37	59	100	150	137	209	7,047	965	1,470	1,285	1,960	13	19
3	Oklahoma	10	17	25	36	35	53	6,849	240	363	319	483	13	19
3	Oregon	7	12	28	41	35	53	6,849	240	363	319	483	17	26
6	Pennsylvania	45	71	110	165	155	236	6,903	1,070	1,630	1,420	2,170	12	19
2	Rhode Island	5	8	26	38	31	46	6,849	212	315	282	418	32	47
3	South Carolina	7	11	25	36	32	47	6,849	219	322	292	429	12	17
2	South Dakota	4	8	12	17	16	25	6,849	110	171	146	228	20	31
4	Tennessee	8	13	32	57	40	70	6,849	274	480	364	638	10	17
6	Texas	33	57	89	134	122	191	6,849	835	1,310	1,110	1,740	11	17
2	Utah	3	5	25	36	28	41	6,849	192	281	256	374	26	38
1	Vermont	2	3	15	25	17	28	6,849	117	192	156	255	40	65
4	Virginia	9	15	32	59	41	74	6,849	281	506	374	673	9	16
4	Washington	9	16	30	54	39	70	7,143	278	500	370	665	12	22
3	West Virginia	5	8	17	24	22	32	6,849	151	219	201	291	11	16
4	Wisconsin	22	37	49	89	71	126	6,849	486	862	646	1,145	16	28
1	Wyoming	2	3	15	25	17	28	6,849	117	192	156	255	46	76

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Source: Staffing--Table 3. Budget--Table 4.

Note: The adjusted average salary is 3 times the state average income except where the state average is below the national figure of $2,283; in states where this is the case the national average was used.

Population Group Code--Millions

1. Under .0.5
2. 0.5 to 1.0
3. 1.0 to 3.0
4. 3.0 to 5.0
5. 5.0 to 10.0
6. 10.0 to 15.0
7. Over 15.0

Abbreviations

Fac. Surv.--Facility Surveillance
Min.--Minimum
Des.--Desirable
Pers. Serv.--Personal Services

for distributing staff needs among the professional disciplines, it was possible to offer generalized guidance as to the functional distribution of staff.

The tabulation below summarizes average staffing and budget guidelines for state water pollution control agencies in the several population groups. It discloses the general range of staff requirements and budget needs, and translates this information into a range of per capita costs. These figures are the averages for the states within each of the several population groups.

Population Group (Millions)	Staffing		Total Budget ($1,000's)		Per Capita Budget--Dollars	
	Minimum	Desirable	Minimum	Desirable	Minimum	Desirable
Under 0.5	17	28	$ 179	$ 300	$0.50	$0.84
0.5 to 1.0	24	32	197	289	0.23	0.37
1.0 to 3.0	30	45	289	426	0.14	0.26
3.0 to 5.0	46	82	424	758	0.11	0.20
5.0 to 10.0	82	128	826	1,289	0.13	0.21
10.0 to 15.0	137	210	1,316	2,024	0.12	0.19
Over 15.0	187	284	2,107	3,195	0.11	0.18

Concluding Observations

Early in this report it was stated that numbers and occupational characteristics of staff and the budgetary support available are only two of the many dimensions of and conditions for successful operation of a state water pollution control program. The present study, in its interviews with state and federal administrators and its observations of state program operations, has lent emphasis to this point of view. The states differ not only in the degree to which their present staffing complements and budgetary allocations approach the guidelines set forth in this report, but also in the adequacy of the legal basis of the program, in the balance of program among the elements of stream and facility surveillance, training of operating personnel, development of basic planning data, and in the firm but

judicious employment of appropriate informational and compliance measures. They differ, too, in the soundness with which present resources of staff are programmed among urgent present needs, longer-term problems, and other program features. They are different in the suitability of pay and career structures for the recruitment and retention of qualified personnel, and even in the strength of administrative and program leadership.

The general findings of the present study thus underscore these additional conditions for successful programs, though they are less tangible and not susceptible of presentation in numerical terms. This fact itself gives added weight to the necessity of treating the findings of the present study on personnel and budgets as guidelines rather than as precise criteria and to the further necessity that each state go beyond these guidelines to a careful consideration of its special problems and its own program content. Only if this approach is taken, will the guidelines offered herein be fully meaningful as a contribution to the improvement of state water pollution control that is so necessary to the physical and economic well-being of the nation.